



Session:
Scenarios and Impacts

Storm IDF Curves

Anna M. Jalowska

Wednesday, 13th October 2021 (1:30-3:30)

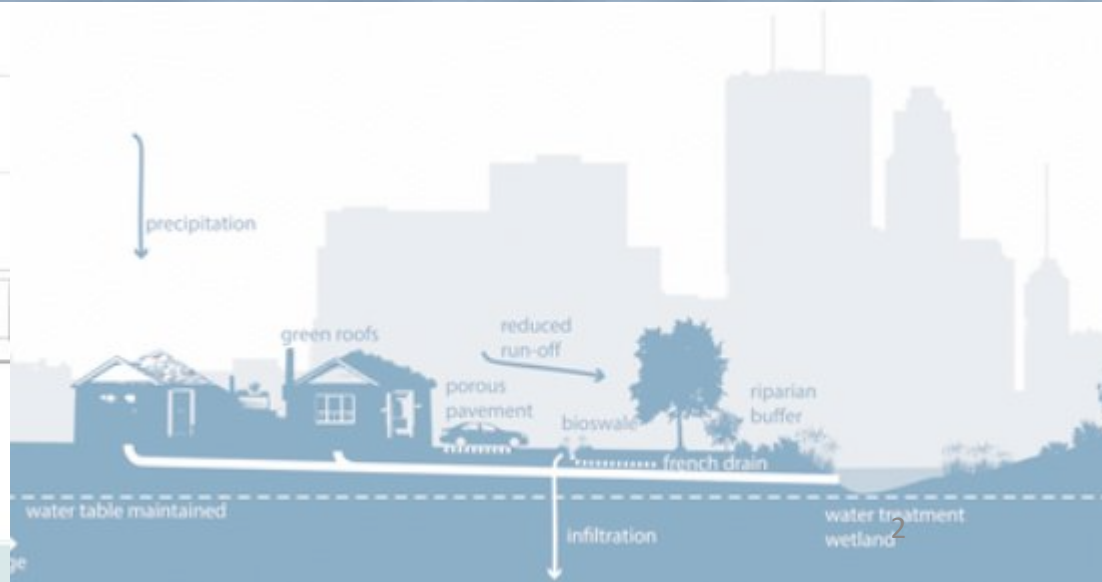
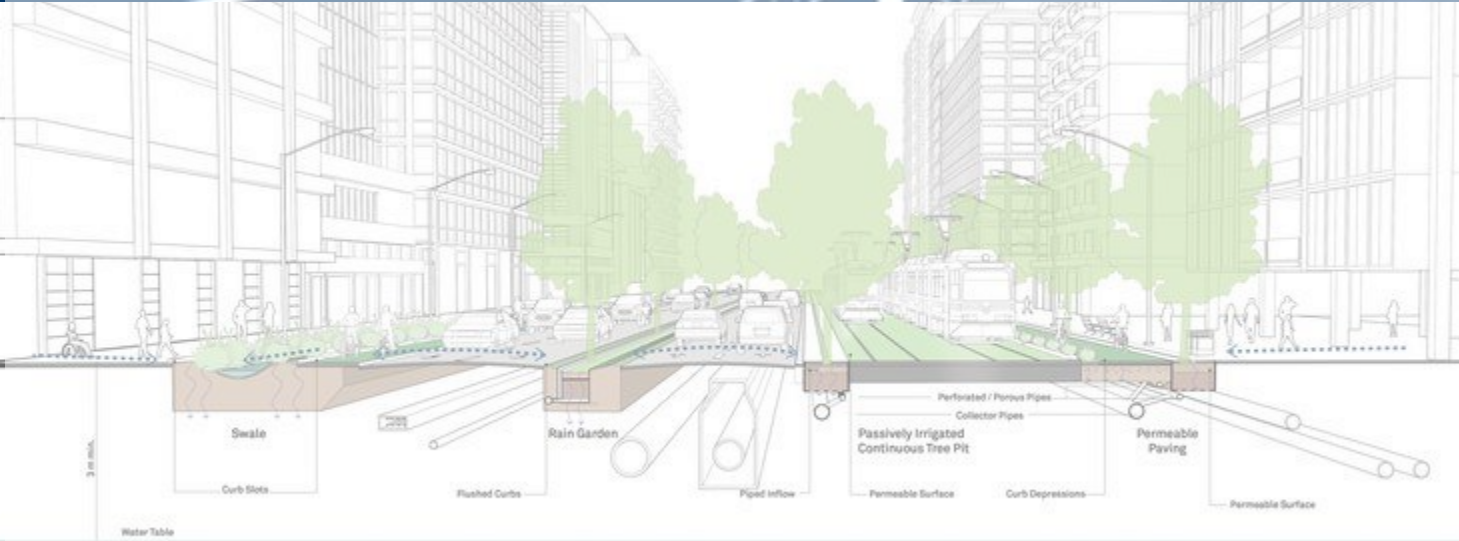
Board of Scientific Counselors (BOSC) Meeting

Air, Climate, and Energy Subcommittee (ACE SC)

for the ACE Research Program

Office of Research and Development

Center for Public Health and Environmental Assessment (CPHEA), Public Health and Environmental Systems Division (PHESD), Environmental Pathways Modeling Branch (EPMB)



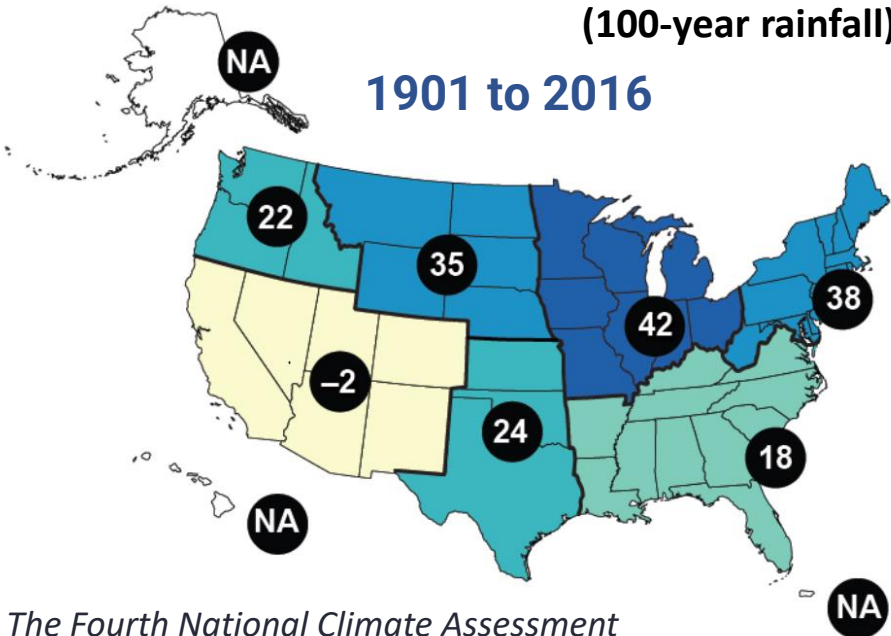
NYC subway during and after Hurricane Ida, 2021



Precipitation Intensity-Duration-Frequency (PIDF) curves represent the probability that an extreme rainfall of particular **INTENSITY** at particular **DURATION** will occur at given location

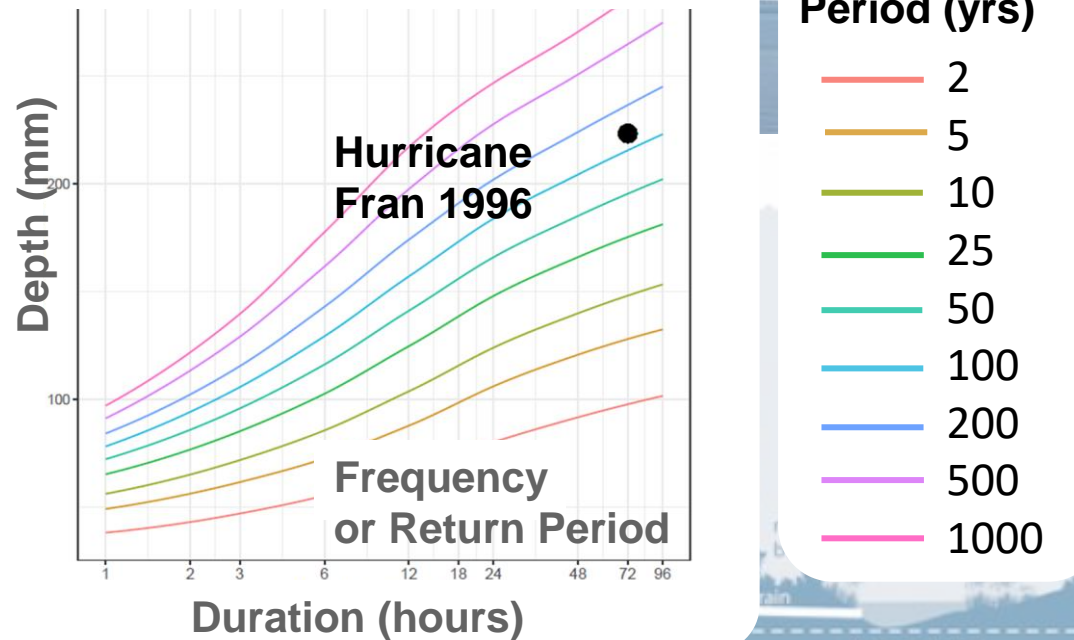
Observed Change in Very Heavy Precipitation (100-year rainfall)

1901 to 2016



The Fourth National Climate Assessment (U.S. Global Change Research Program, 2018)

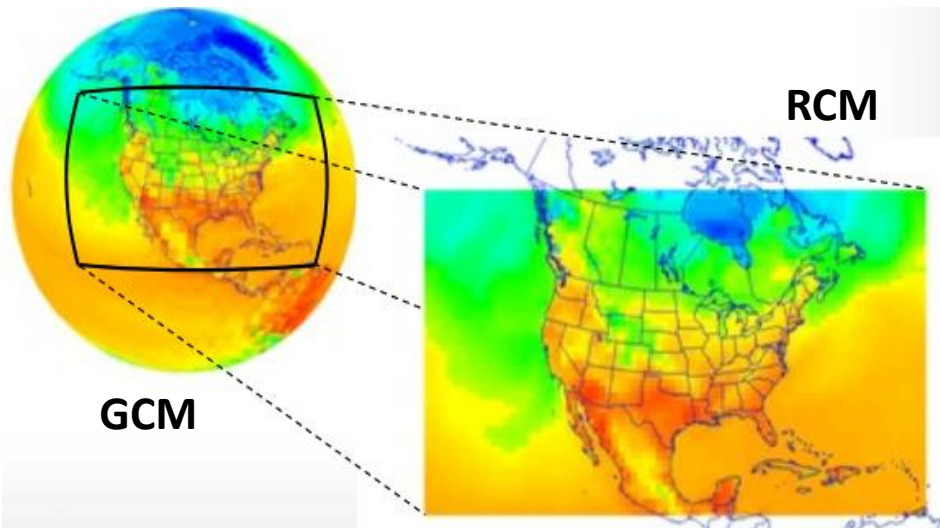
IDF curves for Raleigh, NC (Atlas14)



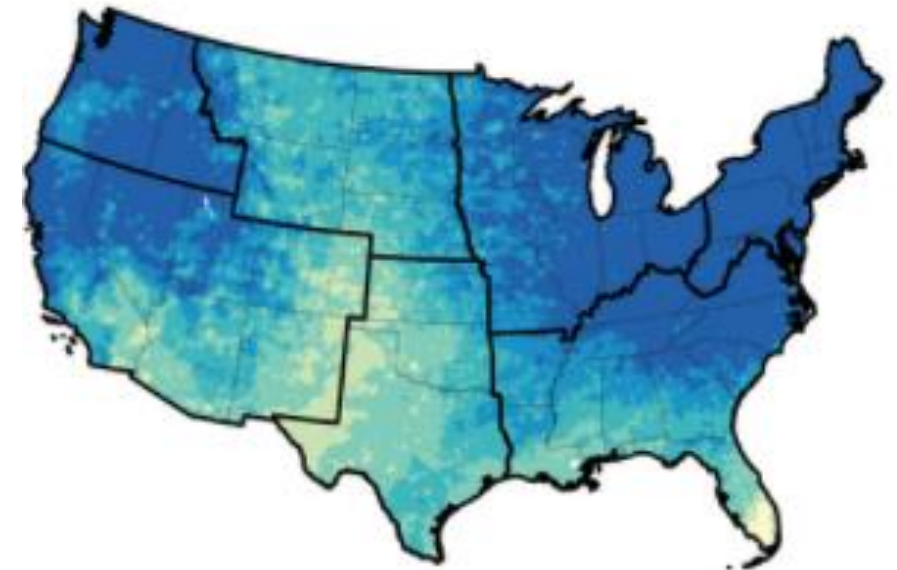
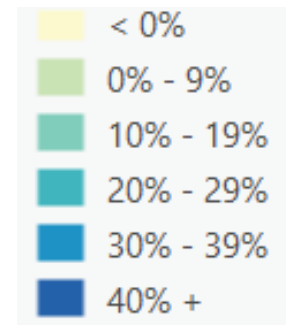
Future Projections

Spatial and temporal resolution

- Global Climate Models (GCMs)
- Regional Climate models (RCMs)- statistically or **dynamically downscaled** GCM's



Projected Change in Very Heavy Precipitation (100-year) *1986–2015 to 2070–2100*



*The Fourth National Climate Assessment
(U.S. Global Change Research Program, 2018)*

PIDF Curves From Gridded Data - a Proof of Concept

OBSERVED DATA

- Extensive analysis of NOAA Atlas14 methodology and NCEI datasets
- Reproduced NOAA Atlas14 methodology and adapted it to gridded/modeled data

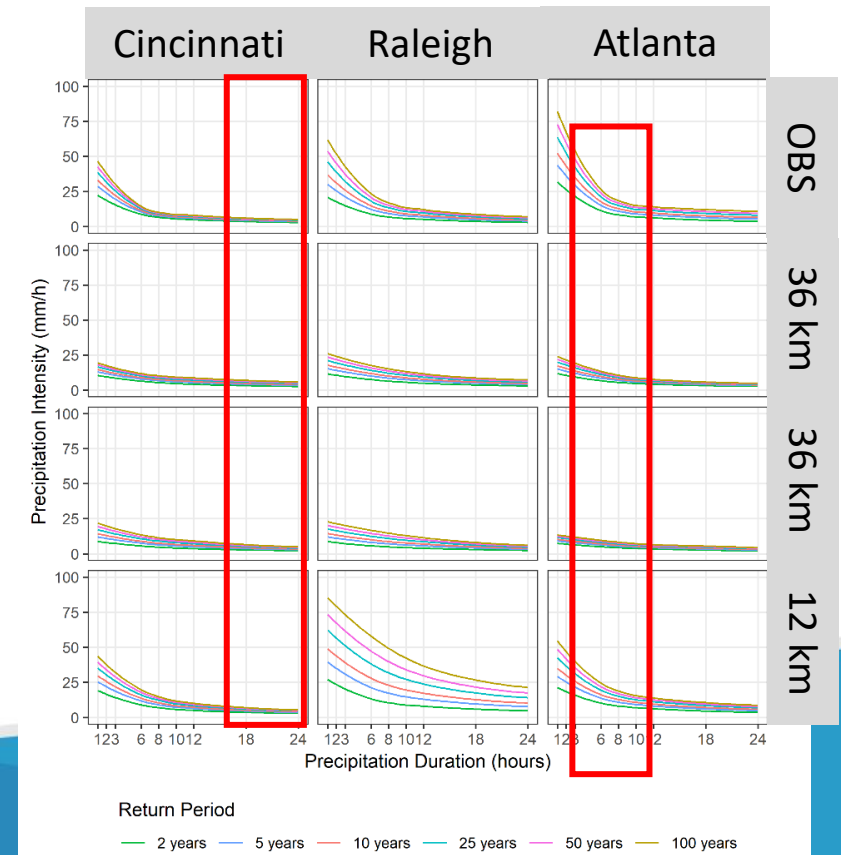
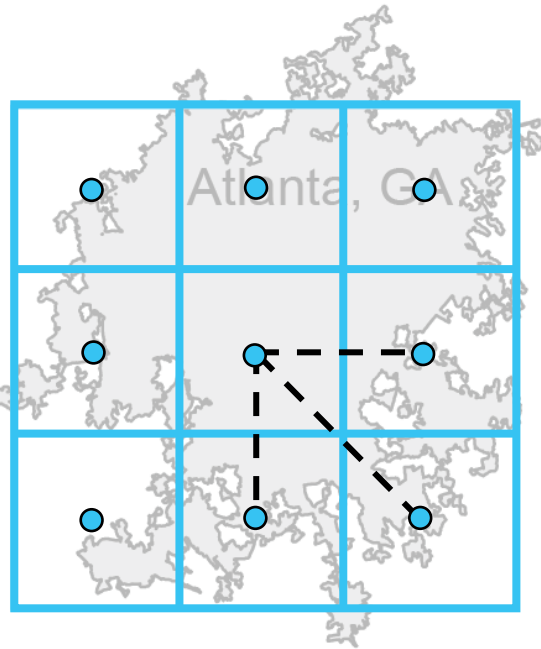
MODEL RESOLUTION

- 36km grid spacing is not sufficient to reproduce sub daily data but can be used for daily extreme precipitation.
- 12km grid spacing was able to resolve sub-daily information.

METHODOLOGY

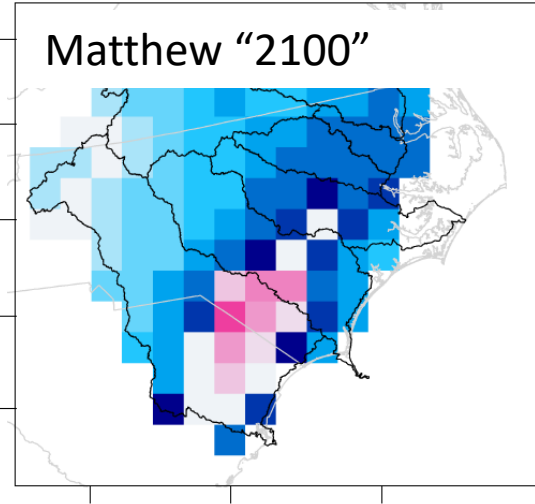
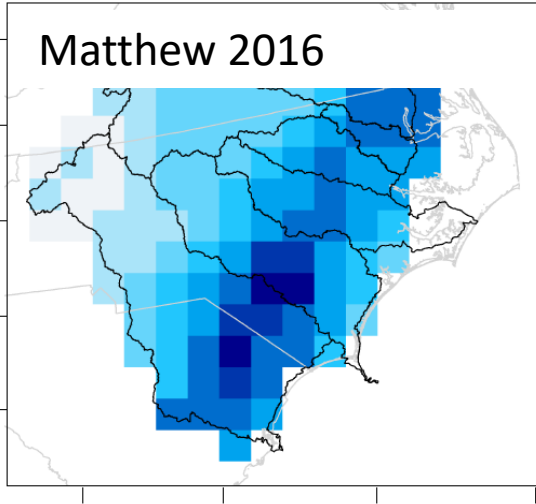
Best results with data aggregated using the Inverse Distance Weighting (IDW) method (RFA and other methods tested)

Jalowska & Spero (2019), JGR Atmospheres
<https://doi.org/10.1029/2019JD031584>



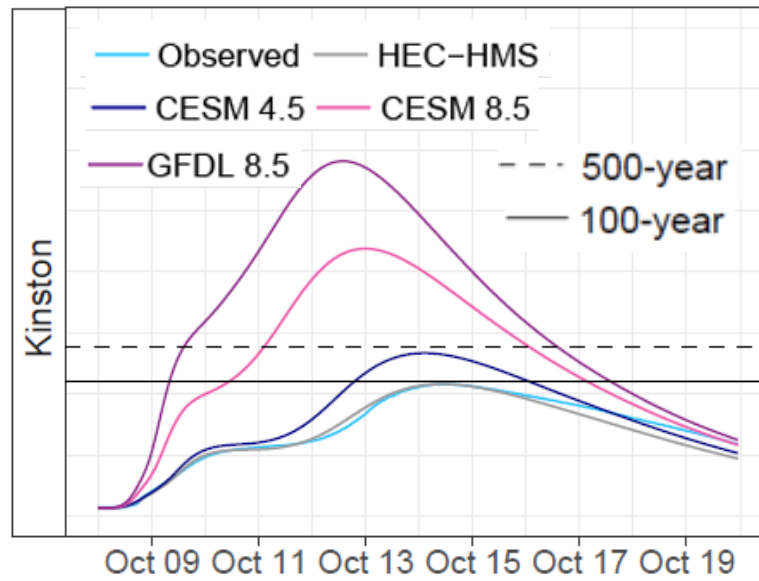
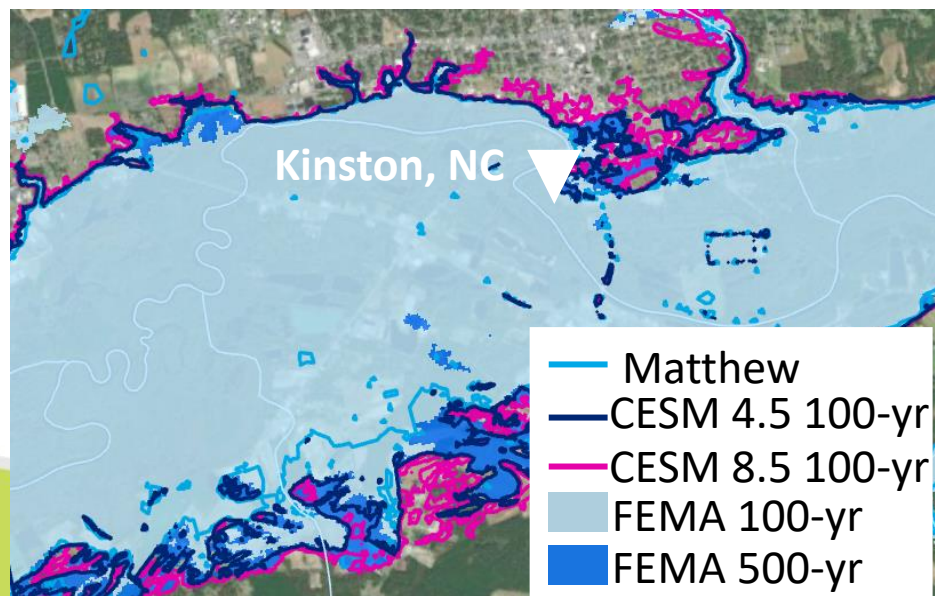
0 12 36 km

Future Projected Rainfall From Tropical Cyclones and Flooding



- Developed PIDF curves from future projected rainfall data under three scenarios
- Design Rainfall Approach (DRA)
- Calculated the change (delta method & design rainfall approach) in the future PIDF curves and applied it to a gridded observed data for three tropical cyclones over Eastern NC

Jalowska et al., npj Climate and Atmospheric Science, 2021



- Used Matthew “2100” rainfall data to produce runoff and stream flow from future tropical cyclone in the Neuse River Basin, NC
- Under either future scenario larger area of Kinston would be within 100-year floodplain

Jalowska et al., in prep 6



*The views expressed
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of the U.S. Environmental Protection Agency.*

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